

REMARKSStatus of the claims:

With the above amendments, claims 1, 3-8, 11, 15-16, and 19 have been amended, claims 20 and 21 have been added, and claims 2, 9, 10, 12-14, and 17-18 have been canceled. Thus, claims 1, 3-8, 11, 15-16, and 19-21 are pending and ready for further action on the merits. No new matter has been added by way of the above amendments. Support for the amendment to claim 1 comes from canceled claims 6, 10, and 14 and page 10, lines 14-17. Support for the amendment to claim 11 comes from claims 12, 13, 14, and 18. All other amendments are merely for form or for clarity. Reconsideration is respectfully requested in light of the following remarks.

Claim Objections

The Examiner has objected to claims 6 and 9 asserting that they do not further limit the claim from which they depend (i.e., claim 1). Applicants disagree with the Examiner regarding claim 6. Applicants believe that by defining both a first and a second hydrogen gas stream as well as how the first hydrogen gas stream passes through the holding member containing the liquid component provides structural characteristics to the hydrorefining unit that further limits claim 1. Claim 9 has been canceled so the objection is moot with respect to this

claim. Withdrawal of the objections is warranted and respectfully requested.

Rejections under 35 USC §112, second paragraph

Claims 9 and 19 have been rejected under 35 USC §112, second paragraph as being indefinite. Claim 9 has been canceled so the rejection is moot with respect to this claim.

The Examiner asserts that it is unknown what is meant by the phrase "hydrocarbon feed oil is hydrocarbon feed oil with a 90% distillation temperature of 250°C". In particular, the Examiner does not know if the 90% is a (vol/vol) or a (wt/wt) ratio. Applicants have amended claim 19 to recite a vol %. Accordingly, Applicants believe that with this amendment that the rejection has been obviated as claim 19 is now neither vague nor indefinite. Withdrawal of the rejection is warranted and respectfully requested.

Rejections under 35 USC §§102/103

Claims 1-3, 5-14, and 16-19 have been rejected under 35 USC §102(b) as being anticipated by, or in the alternative under 35 USC §103(a) as being unpatentable over Cash '203 (US Patent No. 4,430,203). This rejection is traversed for the following reasons.

Present Invention and its advantages

The stripping in the instant invention is to remove impurities such as hydrogen sulfide and ammonia etc., from the liquid component by feeding hydrogen gas to the liquid component that has accumulated in a holding member. See page 3, lines 21-24, and page 10, lines 10-14 and 22-24 of the specification.

Cash '203 discloses at col. 2, lines 38-42:

Part of the vapor phase in interface 25 is withdrawn from the upper portion of the interspace via line 28. The portion of vapor withdrawn is replaced with hydrogen introduced into the lower portion of the interspace (i.e., below the vapor withdrawal point) via lines 13 and 29.

Applicants point out that this arrangement does not achieve the stripping recited in amended claim 11. In order to achieve the stripping in Cash '203, it is necessary to remove, from the upper portion of the sieve tray, hydrogen gas introduced from the lower portion of the sieve tray together with vapor (gaseous stream out of the bed 19).

However, Cash '203 discloses

The sieve tray mounted transversely assists in mixing and restricts back flow of cooler, pure gas to the withdrawal device (see col. 3, lines 1-7).

This means that the hydrogen introduced from the lower side of the sieve tray is prevented from withdrawal from the upper side of the sieve tray. Thus, stripping is not achieved in Cash '203.

As mentioned for the purpose of performing the stripping, the instant invention removes not only the gas stream from the upper catalyst, but also the hydrogen gas used for stripping. Accordingly, the flow of both hydrogen and withdrawal gas must be controlled for the stripping as recited in claims 1 and 11. Cash '203 does not teach or suggest a means or a step for adjusting the necessary pressure for the stripping with cocurrent contact of the liquid component and hydrogen as is disclosed and claimed in independent claims 1 and 11.

Further, although Cash '203 discloses a reduction of impurities in hydrogen gas, Cash '203 does not teach or suggest the reduction of impurities in the liquid, which is the object of the stripping as mentioned. In particular, Cash '203 does not teach or suggest any desulfurization conditions for reducing the sulfur content to a level of not more than 150 ppm, in which hydrogen sulfide and ammonia contained in the liquid phase must be strictly controlled as described on page 2, lines 12-21. Accordingly, Cash '203 does not recognize the problem to be solved by the instant invention. Accordingly, Applicants submit that Cash '203 cannot anticipate nor can it render obvious the instant invention because Cash '203 fails to disclose the elements of the instantly claimed invention. The rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

Rejections under 35 USC §103

Claims 4 and 15 are rejected under 35 USC §103(a) as being unpatentable over Cash '203 in view of Graziani '364 (US Patent No. 4,695,364). This rejection is traversed for the following reasons.

Present Invention

The present invention, as recited in claim 1, relates to a hydrorefining unit for hydrorefining hydrocarbon feed oil including sulfur-containing compounds. The hydrorefining unit comprises:

- a first catalyst layer and a second catalyst layer;
- a holding member positioned between the first catalyst layer and second catalyst layer for temporarily holding a liquid component that flows out from the first catalyst layer;
- a hydrogen feed source;
- a hydrogen introduction part, that is connected to the hydrogen feed source and that is arranged on the downstream of the holding member and on the upstream of the second catalyst layer, for simultaneously introducing hydrogen from the hydrogen feed source to the liquid component held in the holding member and the second catalyst layer;

a separation space that is positioned at the bottom of the first catalyst layer for separation of vapor component and liquid component;

a gas outlet through which the vapor component is discharged from the separation space; and

means for adjusting pressure of the separation space and/or a space between the holding member and the second catalyst layer.

The present invention, as recited in claim 4, also relates to a hydrorefining unit as disclosed above, wherein the holding member is a tray which has a discharge hole for liquid component and in which liquid component accumulates.

Disclosure of Cash '203

Cash '203 discloses a multistage hydrocracking or hydrotreating process wherein a two-phase reaction mixture of a hydrogen rich gas stream and liquid hydrocarbon is passed through a series of spaced catalyst beds and reaction vapors are withdrawn at each interspace between beds and replaced with hydrogen. Such withdrawal and replacement is said to reduce the partial pressure of NH_3 and/or H_2S in the reaction mixture entering the bed succeeding each interspace, thereby increasing the reaction rate between hydrogen and the liquid hydrocarbon.

Disclosure of Graziani '364

Graziani '364 discloses a multistage hydrodewaxing process for hydrodewaxing a hydrocarbon feedstock, such as a heavy or light distillate. A two-phase mixture of a hydrogen-rich gas stream and a liquid hydrocarbon is passed through a series of spaced catalyst beds in a single reactor, reaction vapors containing olefins, are withdrawn at each interspace between beds and replaced with hydrogen-rich saturated gas.

Removal of the Rejection over Cash '203 in view of Graziani '364

As was pointed out above, the stripping performed in the instant invention is to remove impurities such as hydrogen sulfide and ammonia etc., from the liquid component by feeding hydrogen gas to the liquid component that has accumulated in a holding member. See page 3, lines 21-24, and page 10, lines 10-14 and 22-24 of the specification.

Cash '203 discloses at col. 2, lines 38-42:

Part of the vapor phase in interface 25 is withdrawn from the upper portion of the interspace via line 28. The portion of vapor withdrawn is replaced with hydrogen introduced into the lower portion of the interspace (i.e., below the vapor withdrawal point) via lines 13 and 29.

Applicants point out that this arrangement in Cash '203 does not achieve the stripping recited in amended claim 11. In order to

achieve the stripping in Cash '203, it is necessary to remove, from the upper portion of the sieve tray, hydrogen gas introduced from the lower portion of the sieve tray together with vapor (gaseous stream out of the bed 19).

However, Cash '203 discloses

The sieve tray mounted transversely assists in mixing and restricts back flow of cooler, pure gas to the withdrawal device (see col. 3, lines 1-7).

This means that the hydrogen introduced from the lower side of the sieve tray is prevented from withdrawal from the upper side of the sieve tray. Thus, stripping is not achieved in Cash '203.

While performing stripping, the instant invention removes not only the gas stream from the upper catalyst, but also the hydrogen gas used for stripping. Accordingly, the flow of both hydrogen and withdrawal gas must be controlled for the stripping as recited in claims 1 and 11. Cash '203 does not teach or suggest a means or a step for adjusting the necessary pressure for the stripping with cocurrent contact of the liquid component and hydrogen as is disclosed and claimed in independent claims 1 and 11.

Further, although Cash '203 discloses a reduction of impurities in hydrogen gas, Cash '203 does not teach or suggest the reduction of impurities in the liquid, which is the object of the stripping as mentioned. In particular, Cash '203 does

not teach or suggest any desulfurization conditions for reducing the sulfur content to a level of not more than 150 ppm, in which hydrogen sulfide and ammonia contained in the liquid phase must be strictly controlled as described on page 2, lines 12-21. Accordingly, Cash '203 does not recognize the problem to be solved by the invention.

Graziani '364 fails to make up for the deficiencies present in Cash '203. Graziani '364 also does not teach or suggest a means or a step for adjusting the necessary pressure for the stripping with cocurrent contact of the liquid component and hydrogen as is disclosed and claimed in independent claim 1 (upon which claim 4 is dependent).

Accordingly, the combination of Graziani '364 and Cash '203 cannot render obvious the instant invention because the combination of these two references fails to disclose or suggest the elements in claim 4. The rejection is inapposite. Withdrawal of the rejection is warranted and respectfully requested.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

If any questions remain regarding the above matters, please contact Applicant's representative, T. Benjamin Schroeder (Reg.

No. 50,990), in the Washington metropolitan area at the phone number listed below.

Pursuant to the provisions of 37 C.F.R. §§ 1.17 and 1.136(a), Applicants respectfully petition for one (1) month extension of time for filing a response in connection with the present application. The required fee of \$110.00 is attached hereto.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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